CLAIMS

1. A gene detection field-effect device provided with an insulation film, a semiconductor substrate, and a reference electrode, comprising:

(a) the insulation film including a nucleic acid probe immobilized on one of the surfaces thereof and is in contact with sample solution containing at least one type of target gene;

(b) the semiconductor substrate being installed so as to abut against the other surface of the insulation film; and

(c) the reference electrode being provided in the sample solution.

2. A gene detection field-effect device wherein two of the gene detection field-effect devices described in Claim 1 are provided and at least two types of nucleic acid probes including a wild-type (normal-type) nucleic acid probe having a base sequence which is complementary with a base sequence of a target gene and a mutant-type nucleic acid probe having a base sequence which is non-complementary with the base sequence of the target gene are immobilized to the respective insulation films of the gene detection field-effect devices.

3. The gene detection field-effect device according to Claim 2, wherein a base at a non-immobilized end, which is an end of the nucleic acid probe not immobilized to the insulation film of the mutant-type nucleic acid probe is different from a base at a non-immobilized end of the wild-type nucleic acid probe.

4. The gene detection field-effect device according to any one of Claims 1 to 3, wherein at least one type of the nucleic acid probe is selected from a group of oligonucleotide, a complementary DNA (cDNA) and peptide nucleic acid (PNA).

5. The gene detection field-effect device according to any one of Claims 1 to 4, wherein the nucleic acid probe is immobilized via a metal electrode.

6. The gene detection field-effect device according to Claim 5, wherein at least one type of the metal electrode is selected from a group of white gold, gold, silver, palladium, titan, and chrome.

7. The gene detection field-effect device according to any one of Claims 1 to 6, wherein a heater and a temperature sensor are further integrated.

8. A method of analyzing gene polymorphism using a gene detection field-effect device according to any one of Claims 1 to 7, including the steps of;

(a) bringing a nucleic acid probe immobilized to an insulation film into contact with sample solution containing at least a target gene to hybridize the nucleic acid probe and the target gene on the insulation film;

(b) introducing cleaning liquid on the insulation film to remove the target gene which is not reacted;

(c) introducing deoxyadenosine triphosphoric acid (dATP), deoxyguanosine triphosphate (dGTP), deoxycytidine triphosphate (dCTP), and deoxythymidine triphosphate (dTTP) as ground substances onto the insulation film along with Taq DNA polymerase as an enzyme for elongation to cause elongation;

(d) introducing cleaning liquid on the insulation film to remove the enzyme and the ground substances which are not reacted; and

(e) introducing buffer liquid on the insulation film and measuring an output value of the gene detection field-effect device.

9. The method of analyzing gene polymorphism according to Claim 8, wherein measuring the output value in step (e) comprises measuring a

differential output value V1 between a first gene detection field-effect device in which the wild-type nucleic acid probe is immobilized and a third gene detection field-effect device in which the nucleic acid probe is not immobilized on the insulation film; measuring a differential output value V2 between a second gene detection field-effect device in which the mutant-type nucleic acid probe is immobilized and the third gene detection field-effect device, and classifying into three patterns; a pattern in which V1 is larger than V2 (V1>V2), a pattern in which V1 and V2 is almost the same (V1≈V2), and a pattern in which V1 is smaller than V2 (V1<V2) and displaying the same.